AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions, and listings, of claims in the application.

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1.-197. (Canceled)

198. (New) A concentration-gradient quantum dot comprising an alloy of a first semiconductor and a second semiconductor, wherein the concentration of the first semiconductor gradually increases from the core of the quantum dot to the surface of the quantum dot and the concentration of the second semiconductor gradually decreases from the core of the quantum dot to the surface of the quantum dot.

199. (New) The concentration-gradient quantum dot of claim 198, wherein the quantum dot has a quantum yield that is at least about 15%.

200. (New) The concentration-gradient quantum dot of claim 198, wherein at least one of the first semiconductor and second semiconductor is a Group II-Group VI semiconductor or a Group III-Group V semiconductor.

201. (New) The concentration-gradient quantum dot of claim 200, wherein the quantum dot comprises an alloy selected from the group consisting of CdSeTe, CdSSe, CdSTe, ZnSeTe, ZnCdTe, CdHgS, HgCdTe, InGaAs, GaAlAs, and InGaN.

202. (New) The concentration-gradient quantum dot of claim 201, wherein the alloy comprises CdSeTe and has a molecular formula $CdSe_{1-x}Te_x$, wherein the alloy comprises CdSSe and has a molecular formula $CdS_{1-x}Se_x$, the alloy comprises CdSTe and has a molecular formula $CdS_{1-x}Te_x$, the alloy comprises ZnSeTe and has a molecular formula $ZnSe_{1-x}Te_x$, the alloy comprises ZnCdTe and has a molecular formula $Zn_{1-x}Cd_xTe$, the alloy comprises CdHgS and has a molecular formula $Cd_{1-x}Hg_xS$, the alloy comprises HgCdTe and

has a molecular formula HgCdTe, the alloy comprises InGaAs and has a molecular formula InGaAs, the alloy comprises GaAlAs and has a molecular formula GaAlAs, or the alloy comprises InGaN and has a molecular formula InGaN, wherein x is any fraction between 0 and 1.

203. (New) The concentration-gradient quantum dot of claim 198, wherein the alloy comprises CdSe and CdTe.

204. (New) The concentration-gradient quantum dot of claim 198, wherein the quantum dot is conjugated to a biological agent.

205. (New) The concentration-gradient quantum dot of claim 198, wherein the quantum dot is encapsulated within a polymer bead.

206. (New) A series of concentration-gradient quantum dots,

wherein each quantum dot comprises an alloy of a first semiconductor and a second semiconductor,

wherein, for each quantum dot, the concentration of the first semiconductor gradually increases from the core of the quantum dot to the surface of the quantum dot and the concentration of the second semiconductor gradually decreases from the core of the quantum dot to the surface of the quantum dot,

wherein the gradient by which the concentration of the first semiconductor increases and the gradient by which the concentration of the second semiconductor decreases from the core of the quantum dot to the surface of the quantum dot varies among the quantum dots of the series,

wherein the size of each quantum dot is within about 5% of the size of the average-sized quantum dot, and

wherein each quantum dot comprises the same semiconductors.

207. (New) The series of concentration-gradient quantum dots of claim 206, wherein each of the quantum dots has a quantum yield that is at least about 15%.

208. (New) The series of concentration-gradient quantum dots of claim 206, wherein at least one of the first semiconductor and second semiconductor is a Group II-Group VI semiconductor or a Group III-Group V semiconductor.

209. (New) The series of concentration-gradient quantum dots of claim 208, wherein the alloy comprises CdSeTe and has a molecular formula $CdSe_{1-x}Te_x$, wherein the alloy comprises CdSSe and has a molecular formula $CdS_{1-x}Se_x$, the alloy comprises CdSTe and has a molecular formula $CdS_{1-x}Te_x$, the alloy comprises ZnSeTe and has a molecular formula $ZnSe_{1-x}Te_x$, the alloy comprises ZnCdTe and has a molecular formula $Zn_{1-x}Cd_xTe$, the alloy comprises CdHgS and has a molecular formula $Cd_{1-x}Hg_xS$, the alloy comprises HgCdTe and has a molecular formula HgCdTe, the alloy comprises InGaAs and has a molecular formula InGaAs, the alloy comprises GaAlAs and has a molecular formula GaAlAs, or the alloy comprises InGaN and has a molecular formula InGaN, wherein x is any fraction between 0 and 1.

210. (New) The series of concentration-gradient quantum dots of claim 206, wherein each of the quantum dots are conjugated to a biological agent.

211. (New) The series of concentration-gradient quantum dots of claim 210, wherein each of the quantum dots is conjugated to a different biological agent, such that each of the different biological agents corresponds to a quantum dot having a unique gradient of the first semiconductor and second semiconductor.

212. (New) The series of concentration-gradient quantum dots of claim 208, wherein each of the quantum dots are conjugated to a biological agent.

213. (New) The series of concentration-gradient quantum dots of claim 206, wherein each of the quantum dots is encapsulated within a polymer bead.

214. (New) A method of detecting a target in a sample, which method comprises:

(i) contacting a sample with the concentration gradient quantum dot of claim 204, wherein the biological agent specifically binds to a target in the sample,

(ii) allowing the biological agent to specifically bind to the target, and

(iii) analyzing the sample via spectroscopy, thereby obtaining a spectroscopic signature of the sample, wherein the spectroscopic signature is indicative of the presence or the absence of the target in the sample.

215. (New) A method of detecting more than one target in a sample, which method comprises:

(i) contacting a sample with the series of concentration-gradient quantum dots of claim 211, wherein each of the biological agents specifically bind to a different target in the sample,

(ii) allowing the biological agents to specifically bind to the targets,

(iii) analyzing the sample via spectroscopy, thereby obtaining a spectroscopic signature of the sample, wherein the spectroscopic signature is indicative of the presence or absence of the more than one target in the sample.

216. (New) A method of producing a ternary concentration-gradient quantum dot comprising a first semiconductor AB and a second semiconductor AC, wherein A is a species that is common to the first semiconductor and the second semiconductor and B and C are each a species found in only one of the first semiconductor and the second semiconductor, which method comprises:

(i) providing a first solution under conditions which allow nanocrystal formation to take place,

(ii) providing a second solution comprising A, B, and C at a molar ratio under conditions which do not allow nanocrystal formation to take place, wherein each of B and C are present in the second solution at a concentration that is reaction-limiting,

(iii) adding the second solution to the first solution, thereby allowing nanocrystal formation to take place, and

(iv) changing the conditions to conditions that halt nanocrystal growth and formation.

217. (New) A method of producing a series of ternary concentration-gradient quantum dots, wherein each of the quantum dots comprise a first semiconductor AB and a second semiconductor AC, wherein A is a species that is common to the first semiconductor and the second semiconductor and B and C are each a species found in only one of the first semiconductor and the second semiconductor, which method comprises:

(i) providing a first solution under conditions which allow nanocrystal formation to take place,

(ii) providing a second solution comprising A, B, and C at a molar ratio under conditions which do not allow nanocrystal formation to take place, wherein each of B and C are present in the second solution at a concentration that is reaction-limiting,

(iii) adding the second solution to the first solution, thereby allowing nanocrystal formation to take place,

(iv) changing the conditions to conditions that halt nanocrystal growth and formation, and

(v) repeating steps (i)-(iv) at least one time, thereby producing at least one other quantum dot of the series, wherein each time the molar ratio of A, B, and C is different from the molar ration of A, B, and C of the other quantum dots of the series.

218. (New) An optoelectric device comprising the alloyed semiconductor quantum dot of claim 198.

219. (New) The optoelectric device of claim 218, wherein the device is a light emitting diode or solar cell.

220. (New) The optoelectric device of claim 218, wherein the quantum dot is used in lieu of the bulk semiconductor material.

221. (New) An optoelectric device comprising the alloyed semiconductor quantum dot of claim 206.

222. (New) The optoelectric device of claim 221, wherein the device is a light emitting diode or solar cell.

223. (New) The optoelectric device of claim 221, wherein the quantum dot is used in lieu of the bulk semiconductor material.